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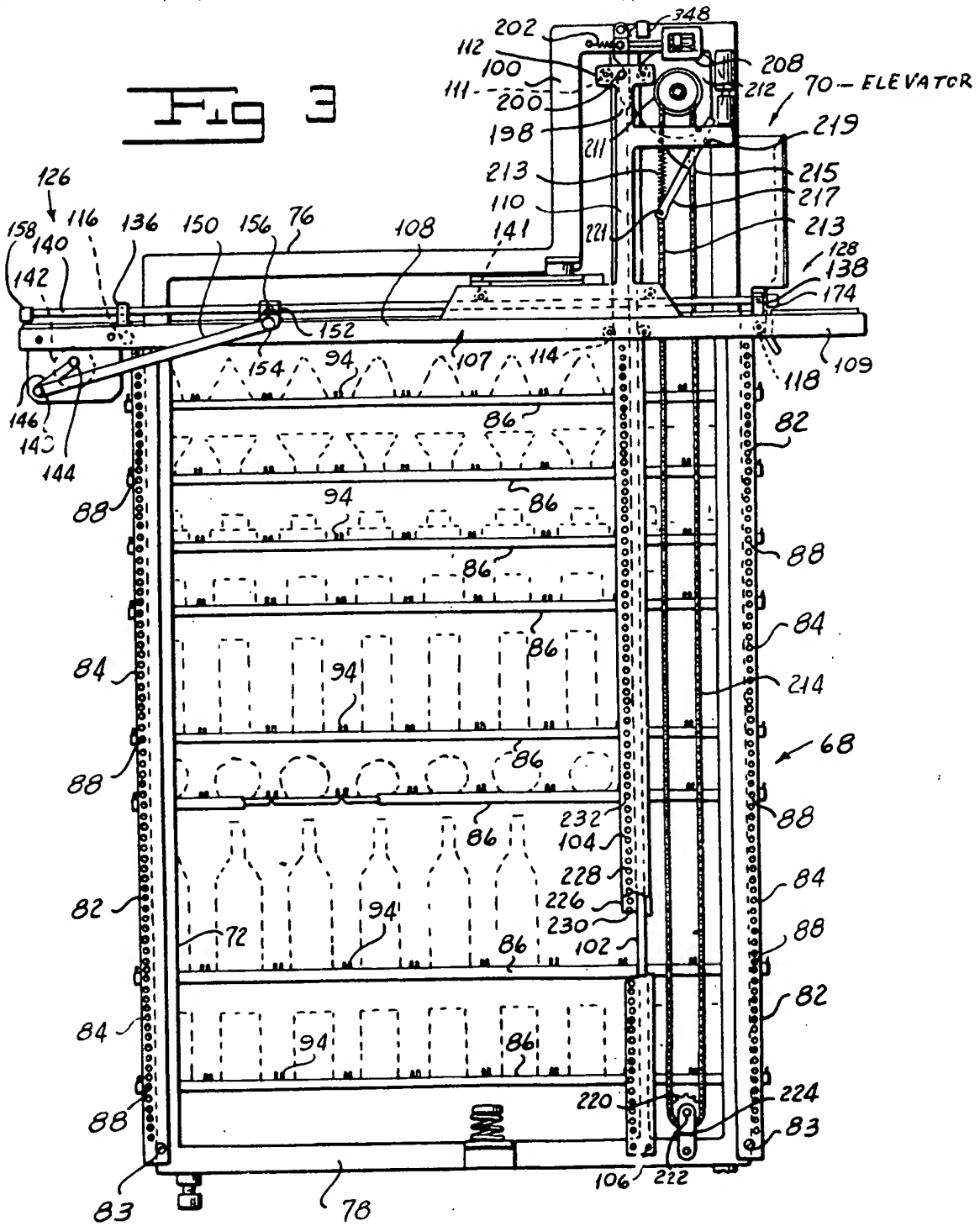
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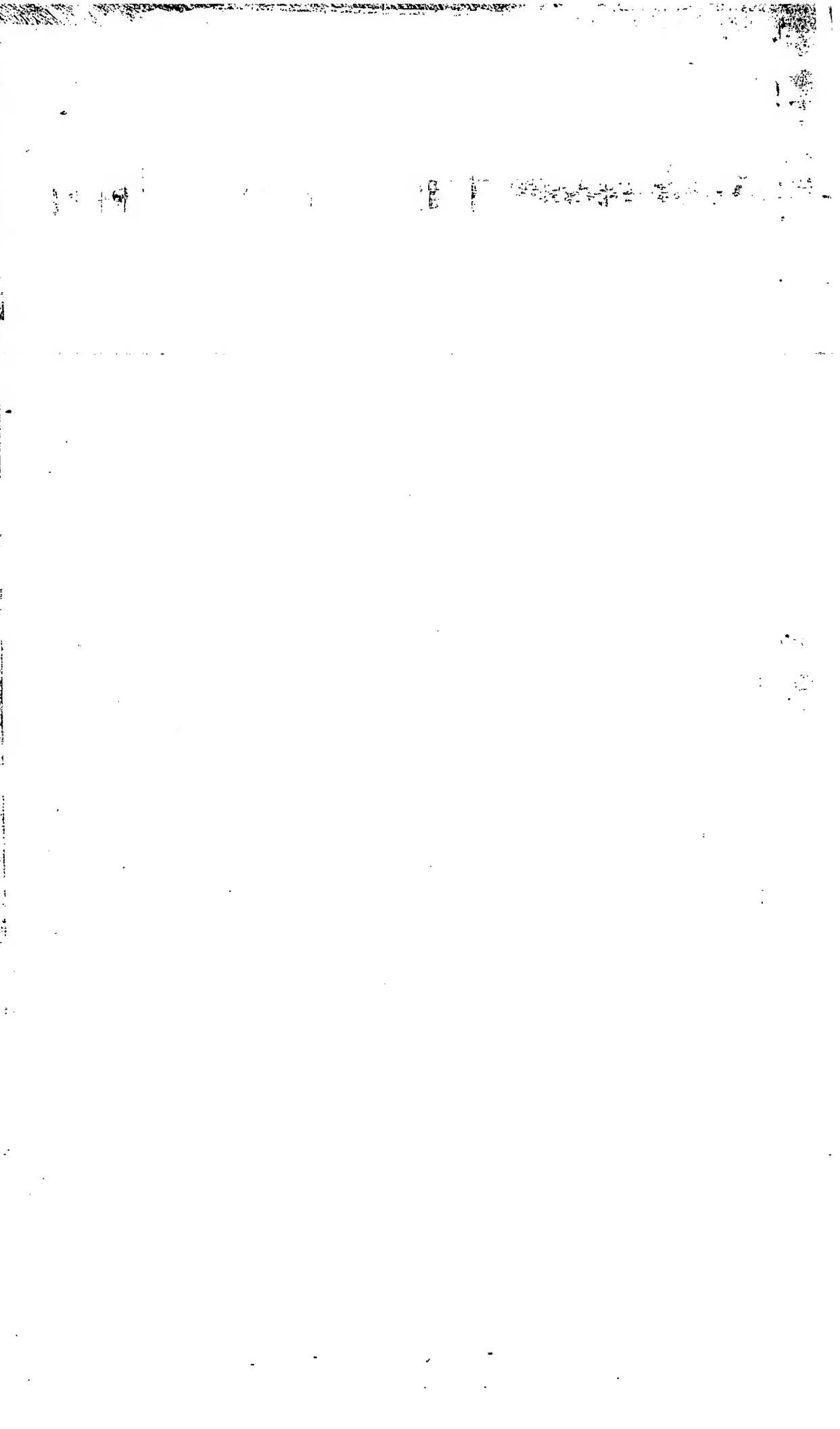
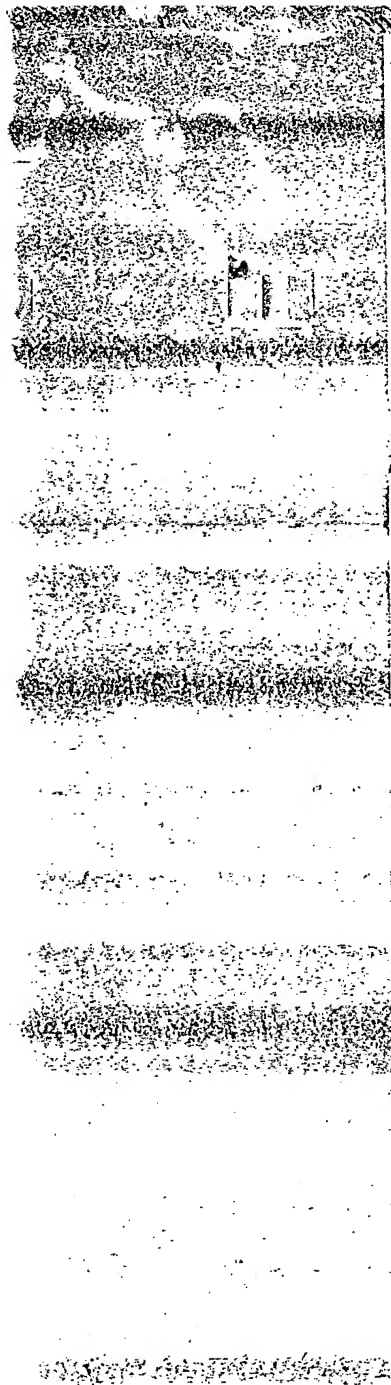
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SHEETS 1 & 2

FIG 3





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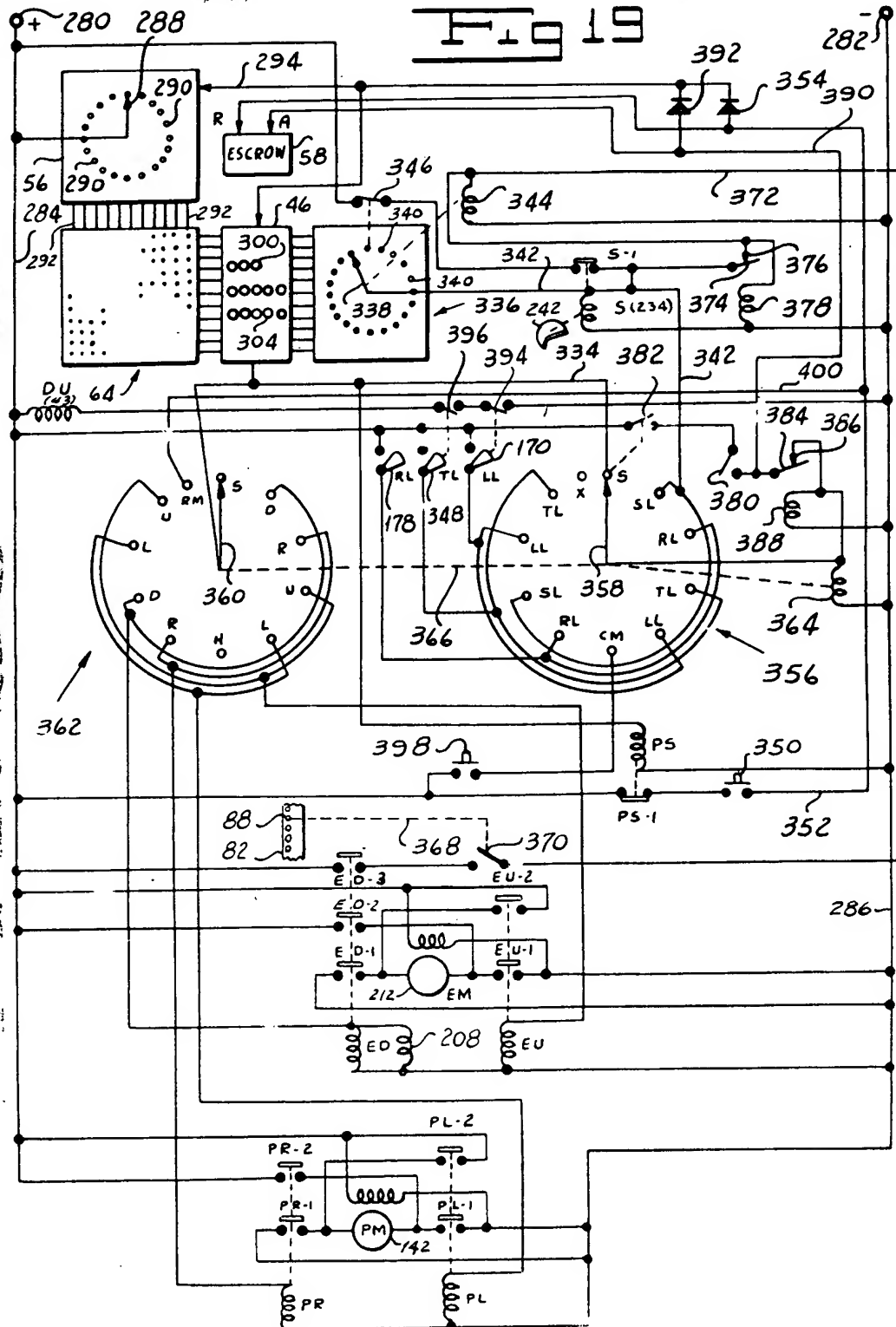
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SHEETS 5 & 7

Fig 19



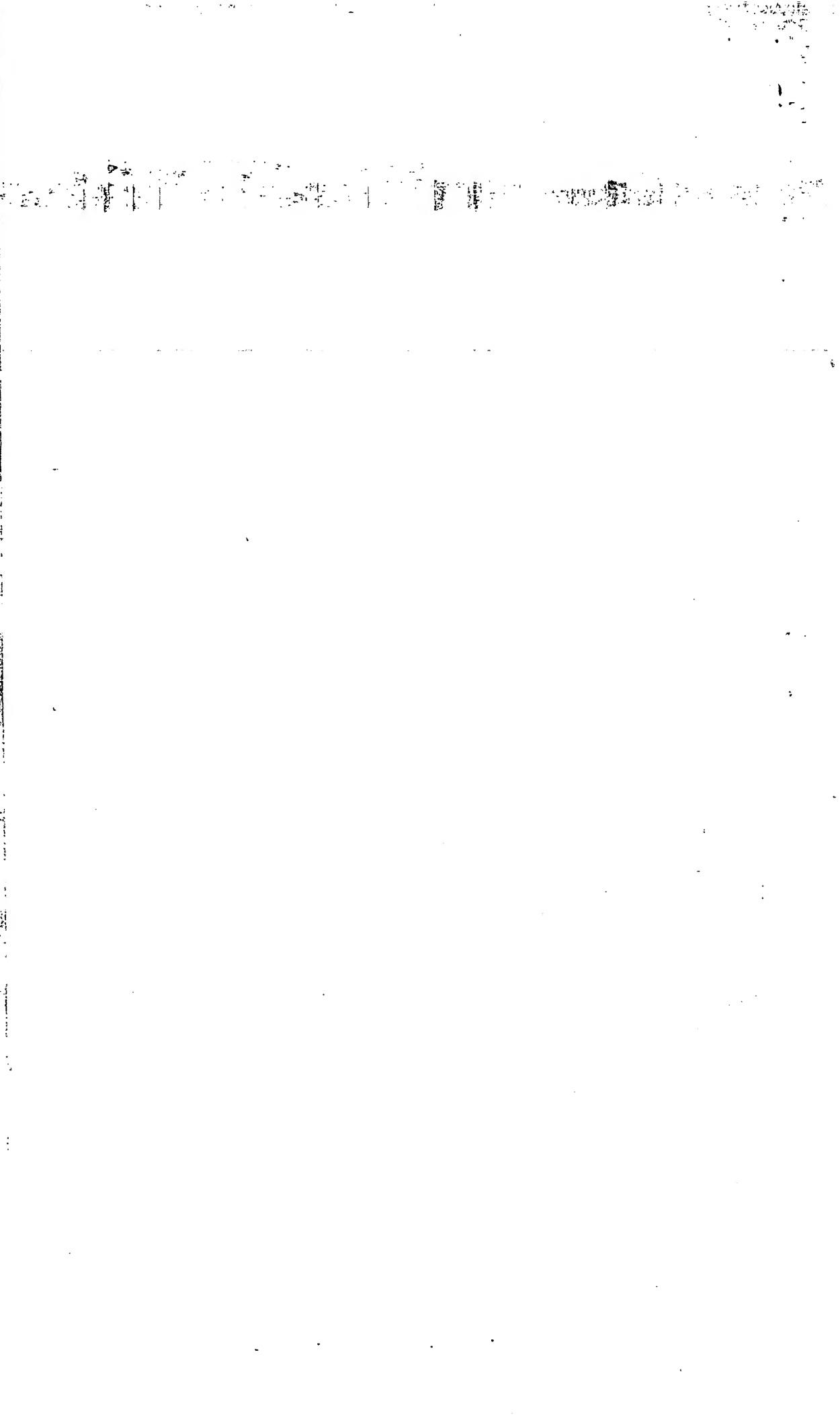
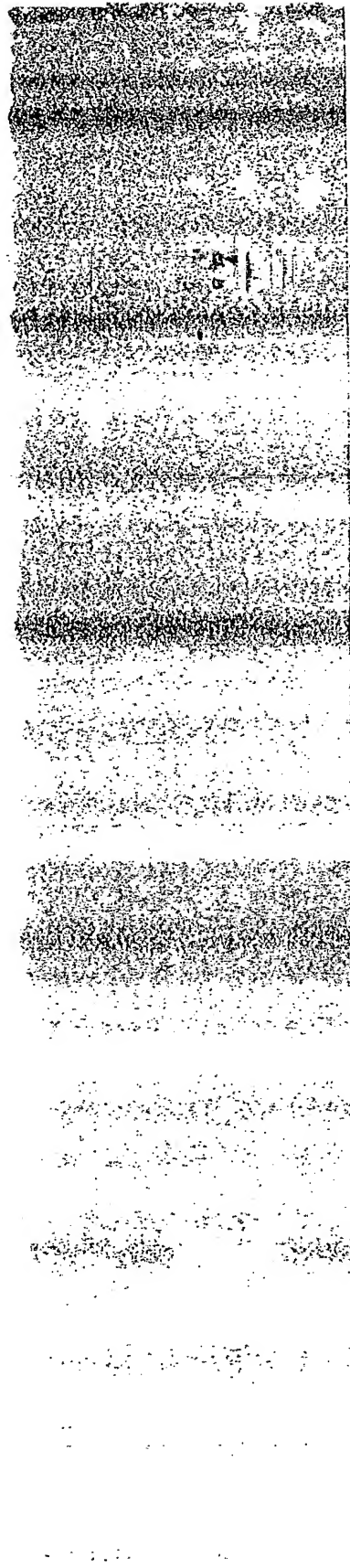
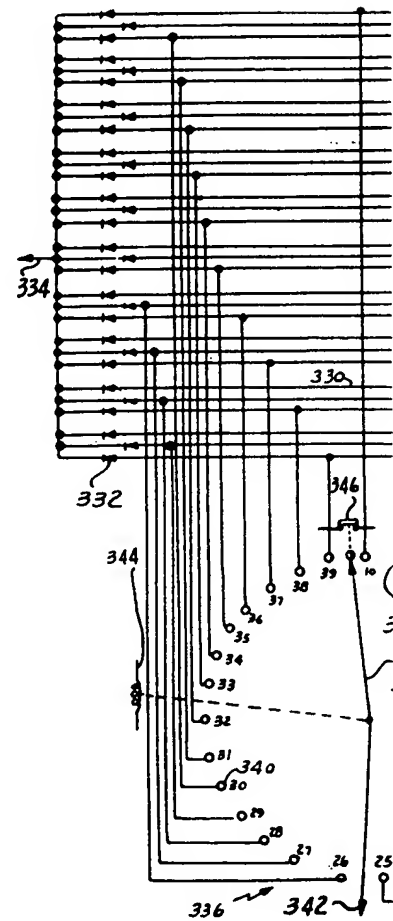
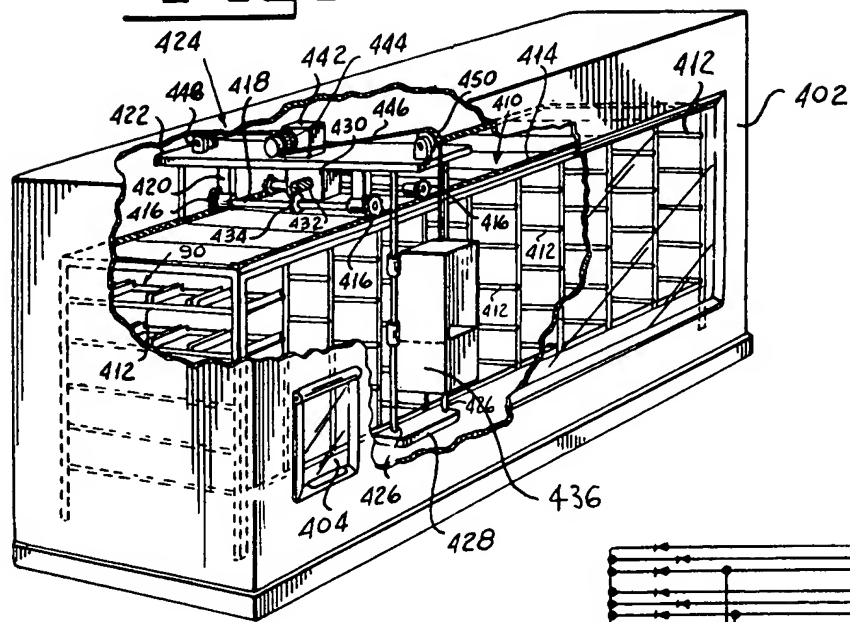


Fig 17







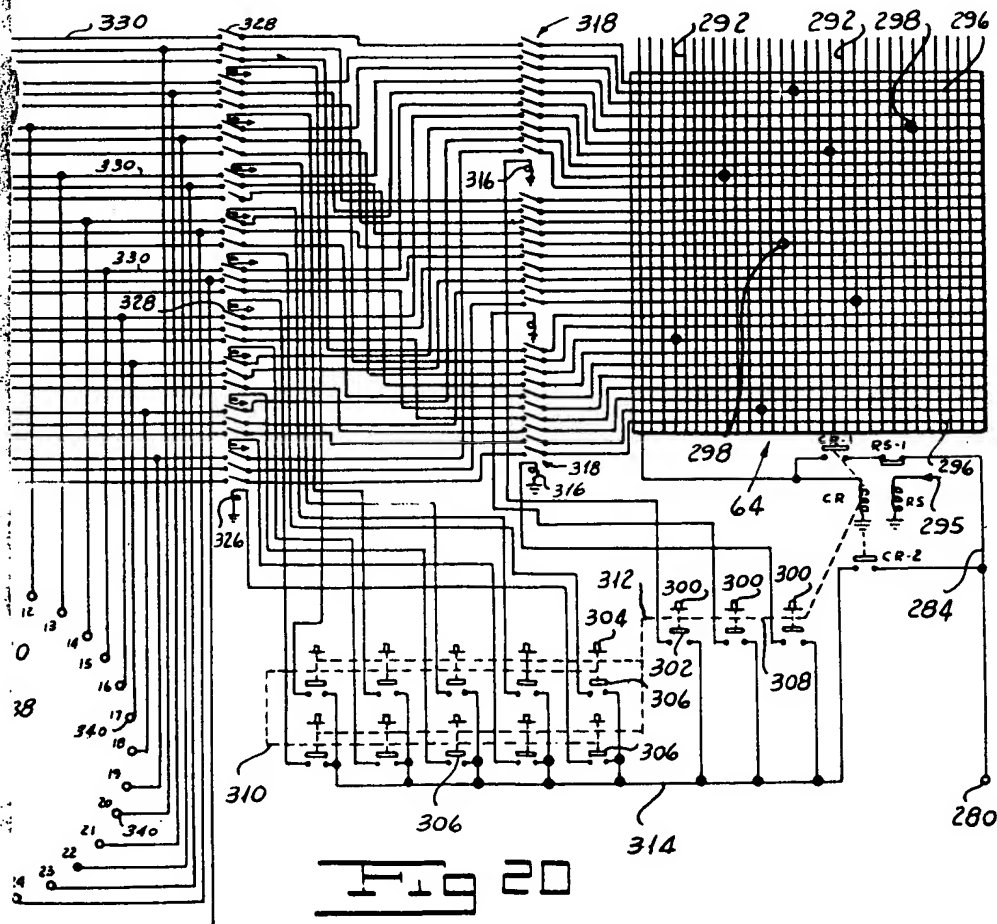
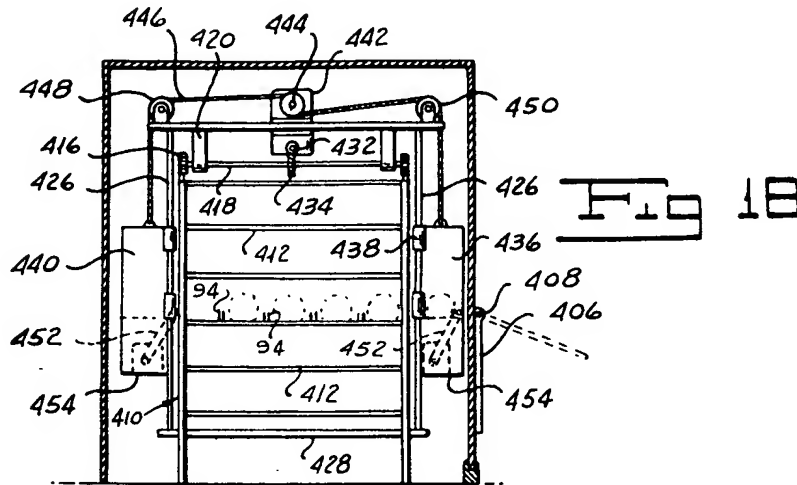
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SHEET 6



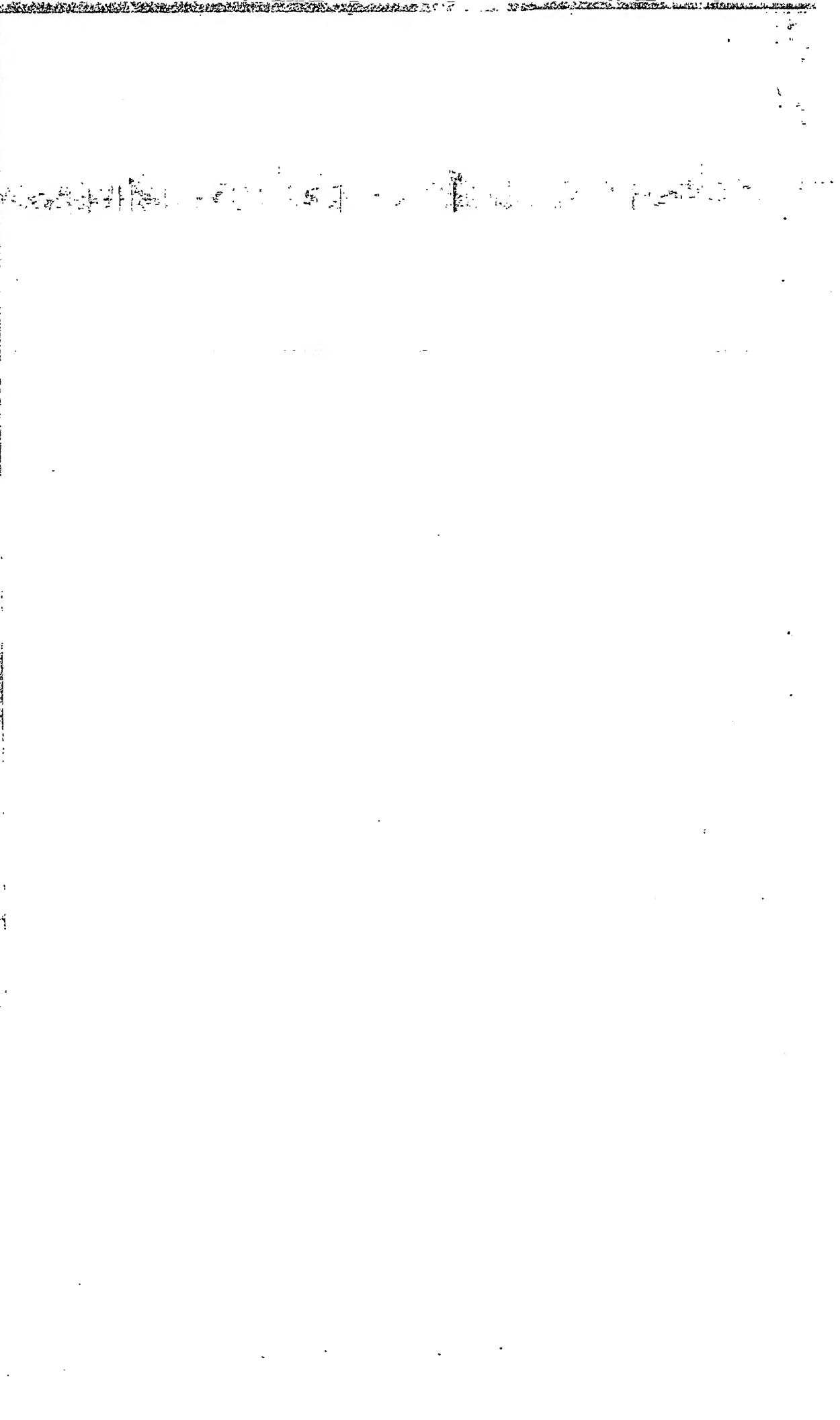
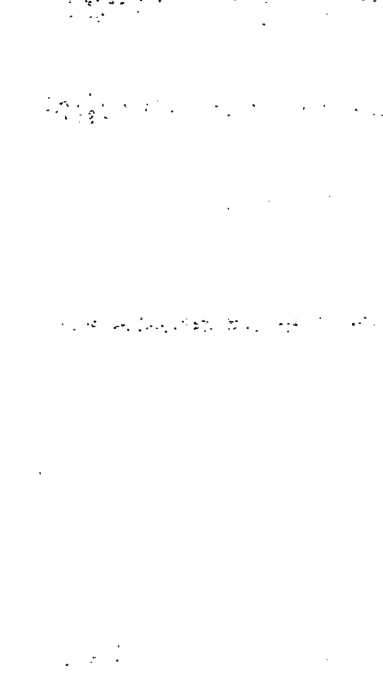
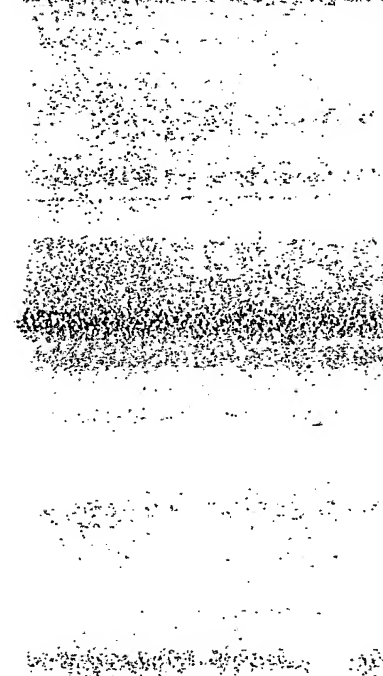
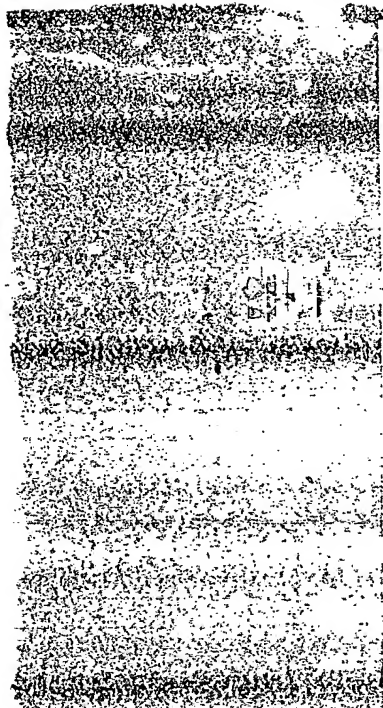


FIG 9

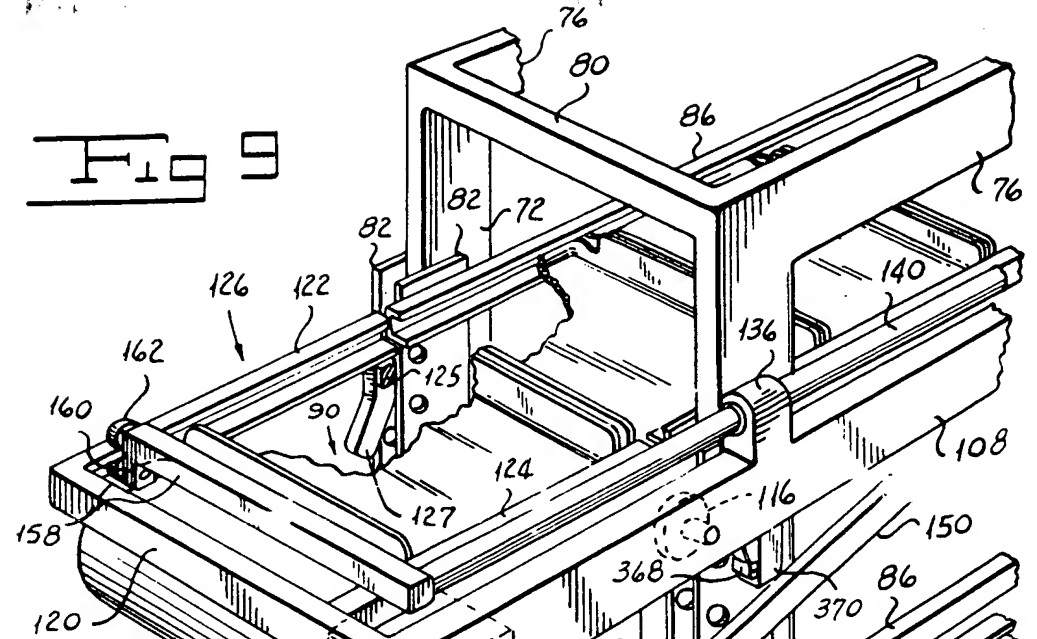


FIG 11

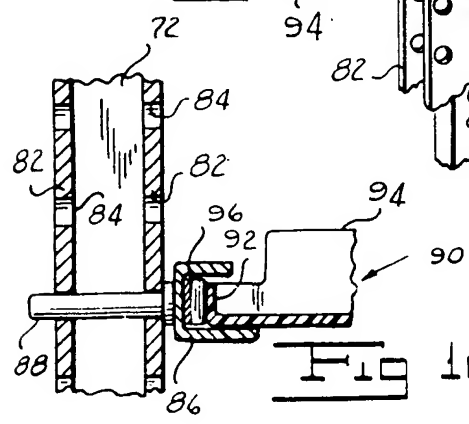
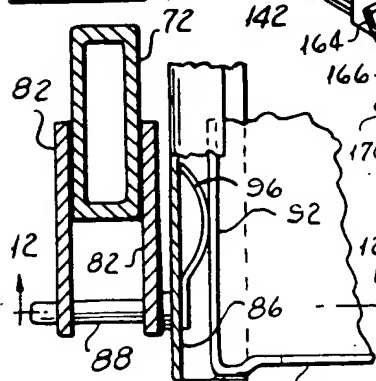


FIG 12



Fig 1

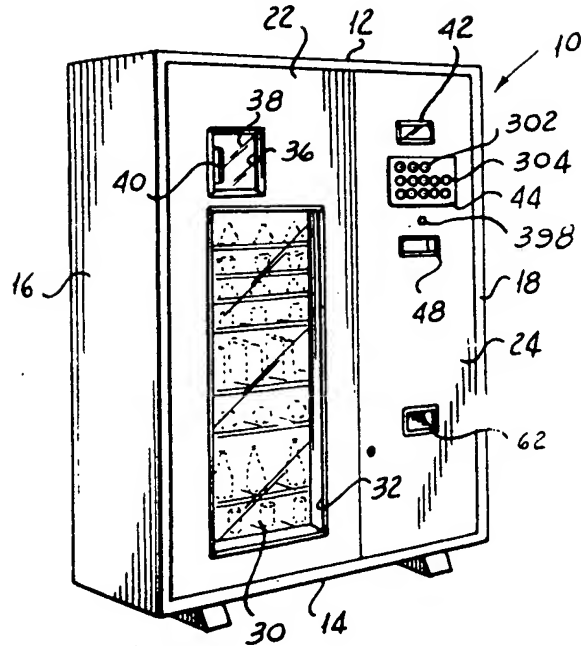


Fig 13

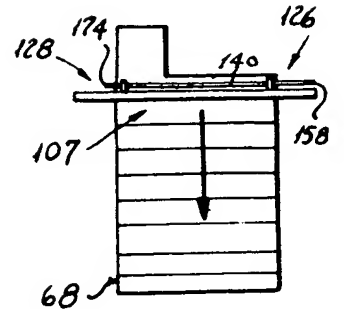


Fig 14

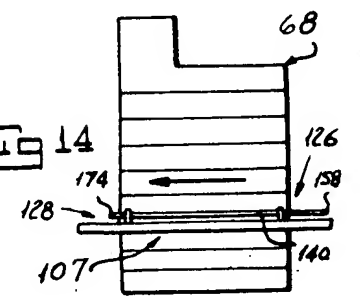


Fig 15

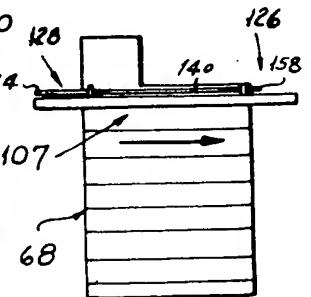
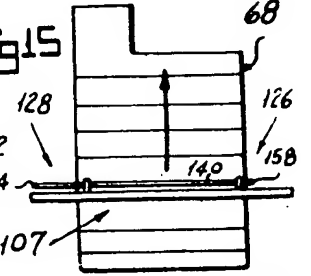


Fig 16

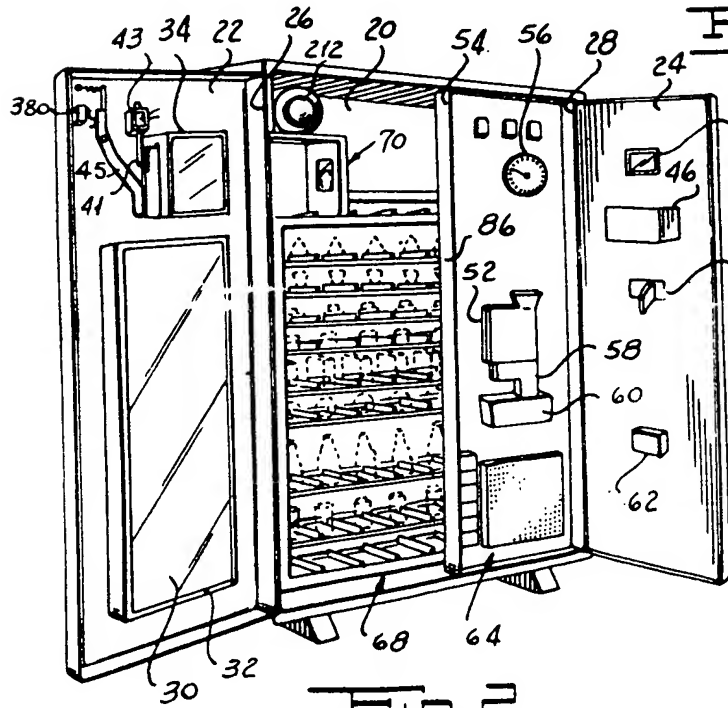


Fig 2









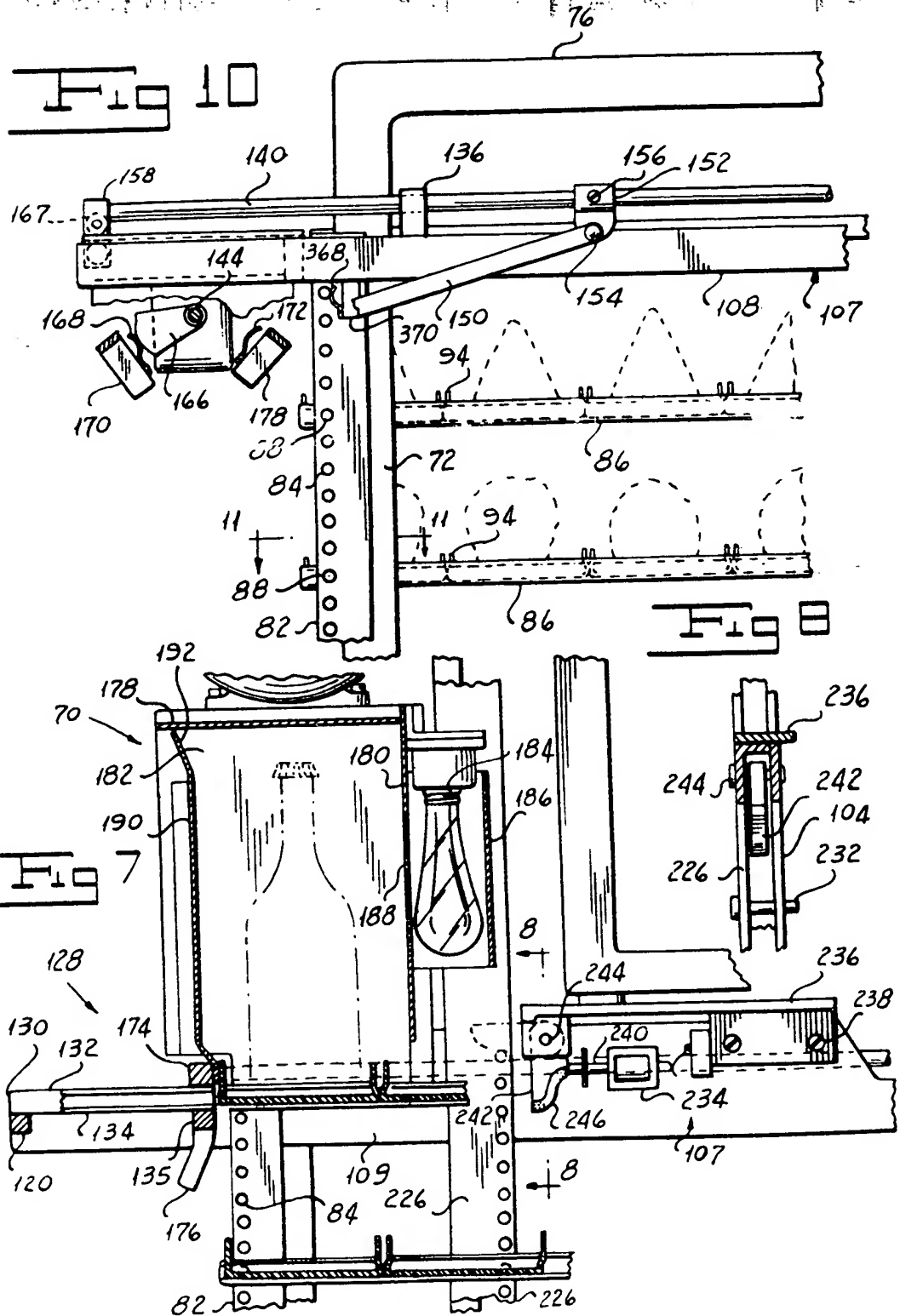
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SHEETS 3 & 4





# PATENT SPECIFICATION

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Date of Application and filing Complete Specification: December 21, 1961.

No. 7369/65

Application made in Germany (No. C23006x/34l) on December 21, 1960.

(Divided out of No. 1,000,604).

Complete Specification Published: August 11, 1965.

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DIV. 3/10

Index at Acceptance:—G4 V (A1X, P1D2, P1D6).

Int. Cl.:—G 07 f.

## COMPLETE SPECIFICATION

### DRAWINGS ATTACHED

#### Article Dispensing Machine

WE, AUTOMATIC CANTEN COMPANY of America a Corporation of the State of Delaware, United States of America, of the Merchandise Mart, Chicago 54, Illinois, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a merchandising machine and more particularly to a travelling independent carrier merchandising machine for dispensing a virtually unlimited variety of products.

Many various forms of merchandising machines are known in the prior art. Many of these machines are adapted to dispense only articles which can be stacked. In such machines a dispensing pusher or the like acts directly on the article being dispensed. In other types of machines, pushers are employed for advancing a series of articles toward trap doors or the like, which are released to permit the article being dispensed to fall under the influence of gravity to a position at which it is accessible to the customer. In general, merchandising machines of the prior art are adapted to dispense only one kind of article though they may be arranged to dispense different brands.

While machines of the type described above satisfactorily dispense articles for which they are designed, at many installations it is desirable that a very large variety of relatively slow selling items be made available to the customer. The impracticality of providing a separate machine for each of these articles is obvious.

According to the present invention there is provided a machine for dispensing articles at a delivery position, comprising means for

storing a row of independently movable article carriers in a storage channel remote from said delivery position, a carriage, means for moving said carriage to a position adjacent said storage channel, means moving a carrier from said storage channel to said carriage at said storage channel, means for moving said carriage to a position adjacent said delivery position, and means for moving a carrier from said carriage to said delivery position.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

Figure 1 is a perspective view of our travelling, independent-carrier merchandising machine with the cabinet doors closed.

Figure 2 is a perspective view of our travelling, independent-carrier merchandising machine with the cabinet door open to expose the dispensing unit.

Figure 3 is a rear elevation of the merchandise dispensing unit of our travelling independent-carrier merchandising machine.

Figure 4 is a fragmentary elevation of a portion of the merchandise dispensing unit of our travelling, independent-carrier merchandising machine illustrating the elevator drive.

Figure 5 is a sectional view of our travelling, independent-carrier merchandising machine taken along the line 5-5 of Figure 4.

Figure 6 is a perspective view of one of the merchandise carriers of our travelling independent-carrier merchandising machine.

Figure 7 is a fragmentary sectional view of the delivery portion of our travelling, independent-carrier merchandising machine.

Figure 8 is a fragmentary sectional view of the elevator latching mechanism of our

[Price 4s. 6d.]

travelling, independent-carrier merchandising machine taken along line 8-8 of Figure 7.

Figure 9 is a fragmentary perspective view of the pusher drive mechanism of our travelling, independent-carrier merchandising machine.

Figure 10 is a fragmentary elevation of the pusher control mechanism of our travelling, independent-carrier merchandising machine with parts broken away and with other parts shown in section.

Figure 11 is a fragmentary sectional view of our travelling, independent-carrier merchandising machine taken along the line 11-11 of Figure 10 and drawn on an enlarged scale.

Figure 12 is a fragmentary section view of the carrier rail mechanism of our travelling, independent-carrier merchandising machine taken along the line 12-12 of Figure 11.

Figure 13 is a diagrammatic view of our travelling, independent-carrier merchandising machine illustrating the position of the parts before a dispensing operation is initiated.

Figure 14 is a diagrammatic view of our travelling, independent-carrier merchandising machine illustrating the relative position of the parts at an intermediate point in the cycle of operation of the machine.

Figure 15 is a diagrammatic view of our travelling, independent-carrier merchandising machine illustrating the relative position of the parts as the pusher moves in to move a carrier out of the selected level.

Figure 16 is a diagrammatic view of our travelling, independent-carrier merchandising machine illustrating the relative position of the parts after a selected article has been moved to the top of the delivery mechanism and before it is positioned behind the delivery door.

Figure 17 is a perspective view of an alternative form of our travelling, independent-carrier merchandising machine.

Figure 18 is a side view of the form of our travelling, independent-carrier merchandising machine shown in Figure 17.

Figure 19 is a schematic view of one form of control circuit which can be employed in connection with our travelling, independent-carrier merchandising machine.

Figure 20 is a schematic view illustrating the details of portions of the control circuit indicated in blocks in Figure 19.

Referring now more particularly to Figures 1 and 2 of the drawings, our travelling, independent-carrier merchandising machine includes a cabinet, indicated generally by the reference character 10, having a top 12, a base 14, sides 16 and 18 and a back 20. We provide the cabinet 10 with respective left hand and right hand front doors 22 and 24 supported on the

cabinet by suitable hinges 26 and 28. We provide the left hand door 22 with a transparent window 30 supported in a frame 32 and so positioned that merchandise on the various dispensing levels of the machine can be viewed by a potential customer. A frame 34 supported in the door 22 slidably carries a door 36 provided with a window 38 through which the article to be dispensed can be viewed. Door 36 has a handle 40 which can be opened to permit the article to be withdrawn by the customer in a manner to be described. A latch 41 on the back of the door 22 normally holds sliding door 36 locked. A solenoid 43 is adapted to be energized to release the latch. Preferably a spring loaded lever 45 urges the door 36 to closed position.

The front of the right hand door 24 is provided with a window 42 through which the customer can view a suitable indicator which shows the credit he has established by the deposit of money in the machine. Door 24 also supports a suitable selector actuating means such, for example, as a pushbutton array 44. It will be understood that any other suitable mechanism such as a dial arrangement could be used to actuate the selecting mechanism. As will be described in detail hereinafter, operation of the pushbuttons 44 actuates a selecting mechanism enclosed in a housing 46 supported on the back of the door. Coins deposited in the machine through a coin slot 48 in the door 24 pass through a coin guide 50 to a coin register 52 carried by a panel 54 supported in the housing 10 behind the door 24. As is known in the art, coins from the register 52 are totaled to actuate a totalizer switch 56 and fall into an escrow mechanism 58 from which they can be directed to a coin box 60 or to a coin return tray 62 in the door 24. The panel 54 also supports a plugboard matrix, indicated generally by the reference character 64.

As will be apparent from Figures 1 and 2, door 22 is considerably wider than is the door 24. We dispose the merchandise delivery unit, indicated generally by the reference character 68, within the cabinet 10 behind the door 22 in a position at which merchandise on its various levels to be described hereinafter can be viewed by the customer. The unit 68 includes a delivery housing 70 positioned behind the door 36. There remains sufficient space to the right of the housing 70 to permit installation of suitable refrigerating apparatus (not shown) as required.

Referring now to Figures 3 to 5 and 7 to 10, the unit 68 includes a pair of generally rectangular frames each formed by uprights 72 and 74 connected by transverse frame members 76 and 78. The two frames are held in spaced relationship by a plurality of

cross pieces 80 at the top and bottom of the frame as required to give the frame rigidity. Each of the uprights 72 and 74 carries a pair of plates 82 secured to the front and rear sides of the uprights 72 by any suitable means such as by bolts 83 or the like. Each of the plates 82 extends for a distance outboard of its corresponding upright 72. We provide this portion of each of the plates 82 with a plurality of equally spaced openings 84. In order to provide one dispensing level of our machine we support a pair of carrier receiving rails 86 at that level by means of pins 88 carried by the rails 86 and removably inserted through the openings 84 in the pairs of plates 82 carried by the uprights 72 and 74. We provide the rails 86 with a channel-shaped cross section to permit the pair of rails at a given level to receive a row of merchandise carriers, indicated generally by the reference character 90.

Referring to Figure 6, each of the carriers 90 is in the form of a tray provided with a peripheral flange 92, the sides of which have vertical extensions 94 which prevent the tray from being withdrawn from the machine at the delivery location as will be described hereinafter. Any suitable material such as a plastic may be used to form the carriers 90.

Referring to Figures 11 and 12, we provide each of the rails 86 with a leaf spring 96 secured to the member by a rivet 98 or the like. The leaf springs 96 bear between the rails 86 and the end carriers 90 to urge the two rails at a level toward plates 82. In this manner the carriers 90 are frictionally held between the rails 86 so that they will not readily slide out if the channel members vibrate and yet they can be moved along the channel members when a positive driving force is applied thereto in a manner to be described.

Referring now to Figures 3 to 5, the rear frame transverse member 76 is provided with an upright extension 100 which supports the elevator drive mechanism to be described hereinafter. A frame upright 102 extending from the top to the bottom of the dispensing unit 68 in the region of the extension 100 carries plate 104 secured to the upright 102 by any suitable means such, for example, as by bolts 106. The elevator, indicated generally by the reference character 107, of our machine includes suspension bar 110 carrying a pair of horizontally extending arms 108 and 109 secured to bar 110 by welding or the like. Respective rollers 111 carried by lugs 112 formed at the top of the bar 110 and respective rollers 114 carried by the arms 108 and 109 engage the edges of the plate 104 to guide the elevator 107 in its movement. Auxiliary rollers 116 and 118 on arms 108 and 109 engage the outboard edges of the plates 82 carried by

the frame uprights 72 and 74 to assist rollers 110 and 114 in guiding the elevator.

Referring now to Figure 9, we form the left end of the arm 108 as viewed from the rear of the unit 68 with a forward extension 120, the end of which carries a transverse member 122 formed with a channel-shaped cross-section to permit it to register with one of the rails 86. We secure a channel member 124 to the extension 120 adjacent the rear rail 86. A strut, such as 125 may be provided to add rigidity to this structure. From the structure just described it will be appreciated that the extension 120 and the members 122 and 124 form the empty carrier receiver, indicated generally by the reference character 126 of our machine, which receiver can register with the rails 86 at any level to receive a carrier therefrom or to position a carrier at a location at which it can be pushed therein in a manner to be described. Preferably we provide a cam finger 127 on the member 122 for pushing into their levels any carriers 90 which have for an reason moved a short distance out of their levels.

Referring now to Figure 7, we form a full carrier receiver indicated generally by the reference character 128, adjacent the left side of the unit 68 as viewed from the front. Receiver 128, like the receiver 126, includes a forward extension 130 carried by the horizontal arm 109, a channel member 132 adapted to register with a rail 86 at the front of the unit as well as a channel member 134 adapted to register with a rail 86 adjacent the rear of the unit. Like the receiver 126, receiver 128 is adapted to register 128 is adapted to register with a level so that its channel members 132 and 134 can receive a carrier 90 from the level or can supply a carrier to the level. We may provide receiver 128 with strut 135 for making the structure relatively rigid.

Referring again to Figures 3 to 5, 7, 9, 110 and 10, a pair of spaced bearing brackets 136 and 138 carried by the arms 108 and 109 slidably support a pusher drive rod 140. A drive motor 142 secured to the underside of the receiver 126 by any suitable means is adapted to be energized to rotate its shaft 144 to oscillate a crank 146 in a manner to be described hereinafter. A pin 148 pivotally connects the end of crank 146 to one end of a connecting link 150, the other end of which is pivotally secured to a bracket 152 by a pin 154. We secure the bracket 152 to the rod 140 by any suitable means such as by a set screw 156 to cause the link 150 to reciprocate rod 140 as crank 146 oscillates under the action of motor 142. The end of the pusher drive rod 140 adjacent the right hand side of the unit 68 as viewed from the front carries for movement therewith a pusher bar 158, the end of which is 100

provided with a bracket 160 which supports rollers 167 adapted to engage the channel member 122 to support the pusher 158 in the course of its movement. It will readily be seen that pusher 158 is in a position such that it will engage a flange 94 of a carrier 90 to move the carrier to the right as viewed in Figure 9 and into a level of the unit 68 as shaft 144 rotates in a clockwise direction as viewed in Figure 9.

Shaft 144 carries for rotation therewith respective cams 164 and 166 having a slight angular displacement. In the position of the parts shown in Figure 9, cam 166 engages the arm 168 of a switch 170 while cam 164 is free. In the other position of the parts at which pusher 158 has completed its inward stroke, in a manner to be described, cam 164 engages the arm 172 of a switch 178 supported on the unit frame while cam 166 is free. These cams 164 and 166 and their associated switches 172 and 170 assist in controlling the sequence of operation of our machine in a manner to be described hereinafter.

The end of rod 140 remote from the pusher 158 carries for movement therewith a pusher 174 which may be provided with rollers 162 for engaging the channel members 132 to guide the pusher. Receiver 128 carries a cam finger 176 adapted to return any carriers 90 which have accidentally moved out of their levels as the elevator moves downwardly.

Referring to Figures 2, 3, and 7, the delivery box or housing 70 has an open front, a top 178, a stationary side wall 180 and a back 182. We position a lamp 184 in front of a shield 186 which directs the light from the lamp through a window 188 into the interior of the box or housing 70. Pusher 174 carries for movement therewith a panel 190 adapted to form the other side wall of the delivery housing 70 when pusher 174 is in its *in* position as shown in Figure 7. We form the upper end of the panel 190 with a cam surface 192 adapted to return any displaced carriers 90 to their levels when the elevator 107 moves upwardly in the course of an operation of the machine to be described hereinafter in which an article of merchandise is to be returned to the level from whence it came.

Referring to Figures 3 to 5, a pivot pin 194 carried on the extension 76 swingably supports a latch 196 having a hook 198 adapted to engage a pin 200 on bar 110 to hold the elevator in its raised position. A spring 202 extending between a pin 204 on latch 196 and a pin 206 on extension 76 normally urges latch 196 into engagement with pin 200. Extension 76 carries a solenoid 208 adapted to be energized in a manner to be described hereinafter to move its armature 270 to the right as viewed in

Figure 5. We connect the armature 270 to the pin 204 to cause solenoid 208, when energized, to move the latch 196 against the action of spring 202 to a position at which the elevator 107 is free to move. We mount a reversible drive motor 212 on the extension 76 by any suitable means known to the art. Motor 212 is adapted to be energized to drive a pitch chain 214 which extends from a sprocket wheel 216 driven by the shaft 218 of motor 212 through a slip clutch 211 to an idler sprocket wheel 220 carried by a shaft 222 supported on a bracket 224 secured to frame member 78. Chain 214 includes a spring 213 which tensions the chain as required for a smooth driving action. A pin 215 provides a driving connection between the chain 214 and the elevator 107. A bar 217 connected to a pin 221 on chain 214 below spring 213 extends between pins 219 on an extension on bar 110. This provides a one-way clutch to ensure a direct connection between the carriage 107 and the chain in the down driving direction of the chain.

As has been pointed out hereinabove, we secure a plate 104 to the rear of the upright 102. We secure a second plate 226 to the front of upright 102 by any convenient means. The spaced plates 104 and 226 have respective sets of holes 228 and 230 at corresponding heights along the length of the plates. In the normal setup of our merchandising machine we mount pairs of channel members 86 at levels on the machine such that sufficient space is left between the successive levels of trays to permit the desired variety of articles to be accommodated.

Referring now to Figures 3, 7, and 8, we insert control pins 232 in corresponding holes 228 and 230 of plates 104 and 226 at levels corresponding to those at which levels of merchandise are arranged. In a manner which will be described in detail hereinafter, when the elevator 107 arrives at a level from which an article of merchandise is to be removed we energize a solenoid 234 supported on a bracket 236 secured to member 108 by screws 238. When solenoid 234 is energized, its armature 240 moves to the left as viewed in Figure 7 to rotate a dog 242, pivotally supported on a shaft 244 carried by a bracket 236, to a position at which a surface 246 on the dog 242 is positioned to engage the pin 232 at that level, thus accurately to position the elevator 107 at the required level so that the receivers 126 and 128 register with the rails 86 at the level. Preferably we form bracket 236 as a heavy cantilever spring to assist in absorbing the shock as the carriage 107 comes to a stop.

Referring now to Figures 19 and 20, we have shown one form of control circuit 130

which may be employed to control the operation of our machine. The positive terminal 280 and the negative or ground terminal 282 of a suitable source 20 of potential respectively supply a conductor 284 and a conductor 286. We connect the contact arm 288 of the totalizer switch 56 to the conductor 284. As is known in the art, in response to the passage of coins to the coin register 54, switch arm 288 steps around to engage a contact 290 corresponding to the total sum in coins deposited in the machine to complete a circuit from the conductor 284 to one of a plurality of price lines 292. As is also known in the art, in response to the presence of a signal on a conductor 294 switch 56 is reset to zero to cancel the credit.

Referring now to Figure 20, all the various price lines 292 pass into the matrix 64 which includes a plurality of lines 296 corresponding to the various possible levels at which pairs of rails 86 can be disposed. The arrangement of the plugboard is such that the conductors 292 passing into the matrix do not make contact with the conductors 296 corresponding to the levels of the machine. However, pins 298 can be inserted into the board to make an electrical connection between a certain price line and a line corresponding to one of the levels. In this manner, the levels of the machine can be made to dispense articles of merchandise at various prices. In the particular example under consideration, we have shown price lines corresponding to from five cents to one-dollar-and-fifty cents in five cent increments and we have shown levels corresponding to the numbers of from 10 to 49. With this arrangement if there is a tier of carriers 90 at the level corresponding to the line 18 and we desire to sell the articles at this level for a price of forty-five cents, we insert a pin 298 into the plugboard at the appropriate point to connect the line 296 corresponding to the eighteenth level to the price line 296 corresponding to a deposit of forty-five cents. When, in the manner described above, the totalizer switch has stepped to a position at which it energizes the forty-five cent price line 292 a circuit is complete from this line through a pin 298 to the line 296 corresponding to the eighteenth level.

The array of push buttons 44 in Figure 1 includes a plurality of first digit push buttons 300 shown in Figure 19 adapted to be actuated to close switches 302 to set up the first digit of the level number. Array 44 includes ten push buttons 304, each of which is adapted to be operated to close a switch 306 to set up the second digit of the level number. Push buttons 300 are provided with a mechanical interlock 308 well known in the art which permits only one

of the buttons at a time to be operated. A similar interlock 310 is provided for the push buttons 304. We also provide a common locking bar, indicated schematically by the broken lines 312, which is adapted to lock push buttons 300 and 304 in the actuated position. In order that the bar 312 be in a position at which it can lock the buttons it is necessary that a winding CR be energized.

We connect winding CR between the five cent price line 292 and ground so that when at least a five cent credit is established winding CR is energized to position bar 312 in its operative position. Energization of winding CR, which indicates that a credit has been established also closes a switch CR1 to provide a holding circuit for the winding CR through a normally closed reset switch RS1 to the conductor 284. Winding CR closes a normally open switch CR2 to complete a circuit from conductor 284 to a common conductor 314 leading to one terminal of each of the switches 302 and 306.

We connect the other terminals of switches 302 to respective windings 316 adapted to close banks of switches 318 connected to the lines 296 to establish the first digit of the level number. The other terminals of switches 306 are connected respectively to windings 326, each of which when energized closes a group of three switches 328 to establish the second digit of the selected level. The switches of the banks 318 and switches 328 are so connected that when a push button 300 and a push button 304 have been operated one of a plurality of conductors 330 carries a signal coming from conductor 284 through the totalizer switch 56, through a conductor 292, through a pin 298, through a line 296, through a switch of a bank 318 and through a switch 328 to the conductor 330. A plurality of respective crystals 332 connect conductors 330 to a common conductor 334 which provides the control signal for our machine.

We connect the individual conductors 330 to the respective contacts 340 of a stepping switch, indicated generally by the reference character 336. As will be explained in more detail hereinafter, in response to pulses fed to a winding 334, the arm 338 steps from a home contact 340 successively around through all the contacts 340 until it arrives at its home position. In this position the arm 338 opens a normally closed switch 346 by any suitable mechanical means. We connect a conductor 342 to the arm 338 so that when an arm 338 engages a contact 340 to which a signal is applied by an energized conductor 330, conductor 342 carries the signal.

Referring again to Figure 19, from the structure thus far described, it will be apparent that in the home position of the



mechanism the right limit switch 178 and a top limit switch 348 operated by the elevator both are closed. In response to the deposit in the machine of any sum in coins, one of the price lines 292 is energized and the push button mechanism is enabled. If the customer should desire to have his money returned before he makes a selection he can operate a coin return push button 350 connected in series with a normally closed contact PS1 between conductor 284 and a conductor 352 which leads to the return terminal of the escrow mechanism 58 to cause the money to be returned. A crystal 354 connects conductor 352 to conductor 295 to energize the winding RS to open contact RS1 which disables the push button mechanism. This signal also resets the totalizer switch in a manner known to the art.

If, after having deposited a sum in coins to set up a credit, the customer then operates two push buttons 300 and 304 to select a level, the articles of which sell at a price corresponding to the sum deposited, then a circuit is complete in a manner described above to conductor 334. We connect this conductor to a proper selection relay winding PS which, when energized, opens switch PS1 to prevent the customer from now having his money returned by operating button 350. Conductor 334 is also connected to a terminal S of a rotary stepping switch, indicated generally by the reference character 356 and having a switch arm 358 adapted sequentially to engage contacts S, SL, RL, TL, LL, CM, RL, SL, LL, TL and X.

Switch arm 358 as well as a switch arm 360 of a second rotor switch 362 is adapted to be stepped around in response to the energization of a winding 364 through a mechanism, indicated schematically by the broken line 366. We connect the control conductor 334 to the switch arm 360 which in its rest position engages its contact S. Winding 364 is connected between the arm 358 and conductor 286. When a signal appears on conductor 334 arm 358 applies this signal to winding 364 to cause arms 358 and 360 to move one step. In this position arm 360 engages a contact D connected to a relay winding ED which closes respective normally open contacts ED1, ED2, and ED3. Contacts ED1 and ED2 are connected respectively between the armature terminals of the elevator motor and conductors 284 and 286 to cause the elevator to drive down. This circuit also energizes the latch solenoid 208 connected in parallel with winding ED. Pins 88 at each rail level actuate an arm 368 as carriage 107 approaches the level to operate a normally open switch 370 once for each of the levels from which our machine can dispense. We connect switch 370 in the series with the

now closed switch ED3 to a conductor 372 to apply pulses to the stepper winding 344 of the switch 336. Each time the winding 344 receives a pulse, arm 338 moves from one contact 340 to the next. When it arrives at the contact 340 corresponding to the selected level it produces a signal on a conductor 342 to operate the solenoid S to move the dog 242 to a position at which it engages a pin.

Operation of the solenoid also closes a switch S1 to complete a circuit through the zero position switch 346 of switch 336 to the conductor 284. This completes a holding circuit for the solenoid and in addition completes a circuit through a resilient contact arm 374 in engagement with a contact 376 to a winding 378. The arrangement of the winding 378 is such that when it is energized it pulls arm 374 away from contact 376 to break its own circuit. When the circuit is broken the arm 374 re-engages its contact 376. In this manner pulses continue to be applied to stepper winding 344 to move arm 338 until it arrives at the home position at which it opens switch 346 to interrupt the holding circuit for the solenoid. This arrangement ensures that switch 336 returns home even though the elevator stops moving down.

Conductor 342 is also connected to contact SL of switch 356 which is now engaged by arm 358. Thus, the pulse on line 342 is applied to stepper winding 364 to move arm 358 from contact SL to contact RL. At the same time arm 360 moves from contact D to contact R. When arm 360 applies power to contact R a winding PR is energized to close normally open switches PR1 and PR2 connected between the terminals of the pusher motor and conductors 284 and 286 to energize the pusher motor to move cams 164 and 166 to the right as viewed in Figure 9. This action continues until switch 178 is closed by its associated cam to complete a circuit from conductor 284 to the RL contact of switch 356. When this occurs, a pulse is applied through arm 358 to winding 364 to step arms 360 and 358 to the next contacts which are, respectively, contact U of switch 362 and contact TL of switch 356. This action breaks the circuit to winding PR and through switch arm 360 completes the circuit to relay winding EU to close contacts EU1 and EU2 to complete the circuit of the elevator motor to cause the elevator to move up.

When the elevator arrives at its up position it closes the top limit switch 348 to complete a circuit from conductor 248 to the TL contacts of switch 356 to apply power through arm 358 to stepper winding 364 to cause the switch arms 360 and 358 to move to the next contacts which are respectively contact L of switch 362 and



contact LL of switch 356. The movement of switch arm 360 breaks the circuit to winding EU and at the same time completes the circuit of a winding PL to close normally open switches PL1 and PL2 to complete the circuit of the pusher motor to drive the pushers 158 and 174 to the left as viewed from the rear of the unit 68. For purposes of clarity we have described the movements of the pushers as viewed from the rear with reference to Figures 3, 4, 9, and 10. When the pushers arrive at their left limit, the associated cam closes switch 170 to apply power to the contacts LL of switch 356 and through the switch arm 358 to stepper 364 to cause arms 358 and 360 to move to the next respective contacts CM and H.

From the structure thus far described it will be apparent that in this position of the parts a carrier 90 holding an article to be dispensed is in position behind the sliding door 36. The customer now has two alternatives. He may open the door and take the merchandise. If he does this, a normally open switch 380 connected in series with the zero position switch 382 of switch 356 closes. This action completes a circuit from conductor 284 through switches 382 and 380 and through a resilient contact arm 384 and its associated contact 386 to a winding 388 to conductor 286. Energization of winding 388 moves arm 384 away from contact 386 to break its own circuit. When the circuit is broken, the arm returns to engage the contact 386. We connect contact 386 to stepper winding 364 to cause this action to return switch arms 358 and 360 to their start position.

Closing of switch 380 also applies power to a conductor 390 which leads to the accept money terminal of the escrow mechanism 58. A crystal 392 connects conductor 390 to the totalizer reset conductor 294 and to the select mechanism reset conductor 295. Thus, as the customer opens the door and takes the merchandise the cycle of the machine is complete. It will be remembered that in this position of the parts switches 170 and 348 are closed to close switches 394 and 396 to energize the door-unlock solenoid DU.

The other alternative of the customer when a carrier holding merchandise has been positioned behind the door 36 is to return the merchandise to the location from whence it came and have his money returned. To accomplish these results, the customer pushes a button 398 to complete a circuit from conductor 284 to the CM contact of switch 356 which is now engaged by arm 358. In this manner power is applied to the stepper 364 to move arm 360 to an R contact and to move arm 358 to engage an RL contact. This completes the circuit to winding PR to cause the pushers to move to the right to

return the carrier to the full carrier receiver of the elevator. When the right limit is reached, power is applied to contacts RL to step arm 358 to engage the SL contact and to cause arm 360 to engage a D contact. As arm 360 leaves contact R winding PR de-energizes and as the arm 360 engages contact D winding ED is energized to cause the elevator to move down. It will be remembered that at this time the selection mechanism has not been reset but remembers the level from which the carrier came. As the elevator moves down, switch 336 steps as before to the selected level and then returns home under the action of winding 378. When it arrives at the selected level a pulse is applied to contact SL to step arms 358 and 360 to the next contact to interrupt the down drive circuit. The next contact engaged by arm 360 is an L contact which completes the circuit of winding PL to cause the pushers to move to the left. The next contact engaged by arm 358 is an LL contact which receives a signal when the pushers 158 and 174 arrive at the left limit positions to step the switches through another step. This interrupts the left drive circuit and establishes the updrive circuit. When the elevator arrives at the top the switches step to the home position. As arm 360 moves by a contact RM, it applies a pulse to a conductor 400 connected to conductor 352 to return the customer's money and reset the selecting mechanism. The machine is now ready for its next operation.

Referring now to Figures 17 and 18, in an alternative form of our travelling independent carrier merchandising machine a housing 402 is provided with a delivery opening 404 which may normally be closed by a swinging door 406 carried by a hinge 408. A frame, indicated generally by the reference character 410, within housing 402 supports a plurality of rails 412, each pair of which is adapted to receive a plurality of carriers 90. The transverse upper members of the frame 410 are provided with racks 414 on which pinions 416 rest. The pinions 416 are carried by spaced shafts 418 rotatably supported in brackets 420 on a platform indicated generally by the reference character 422 comprising one element of a carriage, indicated generally by the reference character 424. Carriage 424 includes the platform 422 a plurality of elevator guide rods 426 and a lower connecting frame 428 which lends rigidity to the assembly. It will be appreciated that frame 428 is disposed below all the merchandise carrying levels so as not to interfere with movement of the carriage 424 laterally of the assembly. A drive motor 430 supported on the underside of platform 422 drives a worm 432 which engages and drives a gear 434 on one of the shafts 418.

Motor 430 may be controlled by any suitable means to position the carriage left and right with reference to the frame 410.

This form of our invention includes a front elevator 436 supported on the front bars 426 by bearing brackets 438. A rear elevator 440 is similarly supported on the bars 426 at the rear of the machine. A drive motor 442 on the platform 422 is adapted to be driven to rotate a drum 444 to wind a cable 446 on the drum or to release the cable. We pass the ends of the cable over respective pulleys 448 and 450 supported on the platform and connect them to the respective elevators 436 and 440. It will be seen that as drum 444 rotates in one direction cable 446 winds up on the drum to raise both elevators 436 and 440. Conversely, when the drum rotates in the other direction the cable is released to permit the elevators to move downwardly under the influence of gravity. Each of the elevators 436 and 440 pivotally supports a respective pusher arm 452 adapted to be rotated by any suitable means such as by a rotary solenoid 454. With the solenoid 454 associated with the elevator 440 energized an empty carrier 90 is pushed into the particular cell with which the elevator is aligned to cause a full carrier 90 to move into the front elevator. If for any reason, the customer wishes to return the article the solenoid 454 of the front elevator 436 is energized to move its arm 452 to push the full carrier 90 back into the cell and to return an empty carrier to the rear elevator.

From the control circuit described hereinabove in connection with the form of our invention shown in Figures 1 to 16, it will be apparent to those skilled in the art that motors 430 and 442 can be controlled to position the two elevators adjacent any particular cell. When they register with the selected cell, the proper solenoid 454 is energized either to advance a full carrier to the front elevator 436 or to return the carrier to the place from whence it came. When this action is complete, the front elevator is moved to a position behind the opening 404 to permit the customer to receive merchandise.

The operation of our travelling independent carrier merchandising machine can best be understood with particular reference to Figures 1, 2, and 13 to 15, all of which show our machine as viewed from the front. The initial positions of the parts of the machine are illustrated in Figure 13. Pusher 158 is in its out position while pusher 174 is in its in position. At this time receiver 126 supports an empty carrier 90. When, as is explained hereinabove, in connection with the control of Figures 19 and 20 coins aggregating the purchase price of an article are deposited in the machine through the

slot 48 and when buttons 302 and 304 of the array 44 are actuated to set up a two digit level number then the motor 212 is energized in a direction to cause elevator 107 to drive down to the position shown in Figure 14. In the course of the movement down of the elevator switch 336 steps around until its arm 338 engages a contact 340 corresponding to the selected level. When this occurs, the down drive is de-energized and dog 242 is moved to a position at which it engages a control pin 232 at the selected level.

When the elevator 107 has thus been moved to the desired level, the pusher motor 142 is energized to move bar 140 to the left as viewed in Figure 14 to cause the empty carrier 90 on receiver 126 to act through the row of carriers 90 at the selected level to move a full carrier onto the received 128. This position of the parts is shown in Figure 15. When the pusher 158 moves to the in limit position cam 164 actuates the in limit switch 178 to interrupt the circuit of motor 142 and to establish the up drive circuit of motor 212 to cause elevator 107 to drive up. When the elevator arrives in its up limit position shown in Figure 16 switch 348 closes to step switch 356, interrupt the up drive circuit for motor 212 and to establish the out drive circuit for motor 142 to cause pushers 158 and 174 to move from the position shown in Figure 16 back to the position shown in Figure 13 at which the merchandise is positioned behind the door 36. When the out limit is reached all the motor circuits are interrupted.

It will readily be apparent from the relative positions of crank 146 and link 148 shown in Figure 9 that the pushers have sufficient overtravel on each stroke to ensure that the carriers moved onto the receivers 126 and 128 are properly positioned to clear the ends of the channel rails 86. Cams 127 and 176 return to their levels those carriers, next to the carriers which move onto the receivers, which have been moved slightly out of their levels by the pushed overtravel. Preferably we provide the receivers 126 and 128 with spring clamps similar to the spring clamps shown in Figures 11 and 12.

At this point in the cycle of operations of the machine the customer may open the door 36 to gain access to the merchandise. When the door opens switch 380 closes to cause the money to be accepted and to set switches 356 and 362 back to their initial positions. If, after an article of merchandise has been positioned behind door 36, the customer changes his mind he can actuate the return button 398 to cause the reverse cycle of operations to take place. That is, under the action of the control circuit the elevator 107 first moves down to the level which had been selected and out

140 moves in a direction to return the carrier containing the article to the level from whence it came. It will be understood that in the course of this operation the empty carrier which has been pushed into the level is returned to the receiver 128. When this operation is complete carriage 107 again moves up and bar 140 then moves to the home position and the control elements of the machine all are reset. The money which had been deposited by the customer is returned. The machine is then ready for its next operation.

While we have shown a form of our machine in which the carriage 107 is an elevator which moves up and down, we could well provide either a vertical carriage moving left and right or a horizontal carriage moving in a horizontal plane. Similarly, while the translators 158 and 174 are pushers moving left and right they could be tractors and they could move up and down if a vertical carriage is employed or laterally in a horizontal plane where a horizontal carriage is used.

It will be seen that we have provided a travelling independent carrier merchandising machine which is adapted to dispense a virtually unlimited variety of merchandise. Our machine can dispense articles which are not capable of being stacked. It can dispense articles which cannot readily be dispensed by machines known in the prior art in which a dispensing element acts directly on the article. Our machine can dispense fragile articles without danger of breakage.

The feature of the machine described above whereby an operator can change his mind and return an article to the storage location is claimed in our copending British Patent Application No. 45753/61 (Serial No. 1000604).

#### WHAT WE CLAIM IS:—

1. A machine for dispensing articles at a delivery position, comprising means for storing a row of independently movable article carriers in a storage channel remote from said delivery position, a carriage, means for moving said carriage to a position

adjacent said storage channel, means for moving a carrier from said storage channel to said carriage at said storage channel, means for moving said carriage to a position adjacent said delivery position, and means for moving a carrier from said carriage to said delivery position.

2. A machine according to claim 1, in which said carriage comprises an empty carrier receiver and a full carrier receiver disposed adjacent the ends of said row (when the carriage is adjacent said storage channel), said empty carrier receiver normally supporting an empty carrier and means are provided for advancing an empty carrier into one end of said row to advance a full carrier from the other end of said row into said full carrier receiver.

3. A machine according to claim 2, in which means are provided for moving a full carrier from the full carrier receiver to the delivery position (when the carriage is in a position adjacent to said delivery position).

4. A machine according to claim 2, in which movement of said full carrier to the delivery position moves an empty carrier to the empty carrier receiver.

5. A machine according to claim 2, in which said means for advancing an empty carrier receiver into said row includes a first movable pusher element for pushing said empty carrier into said row.

6. A machine according to claim 3 or 4 in which said means for moving a full carrier to the delivery position comprises a second movable pusher element for pushing said full carrier into said delivery position.

7. A machine according to claims 5 and 6 in which said first and second pusher elements are movably mounted on the carriage, and actuating means are provided for selectively moving said pusher elements.

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